

GIS DataPRO™



Getting Started with the GIS DataPRO Software

Version 3.0

English

Leica
Geosystems

Symbols Used in this Manual

Symbols used in this manual have the following meanings:



Important paragraphs which must be adhered to in practice, as they enable the product to be used in a technically correct and efficient manner.

Bolded Text Indicate dialog boxes, tabs, menu choices, or other commands in GIS DataPRO software.

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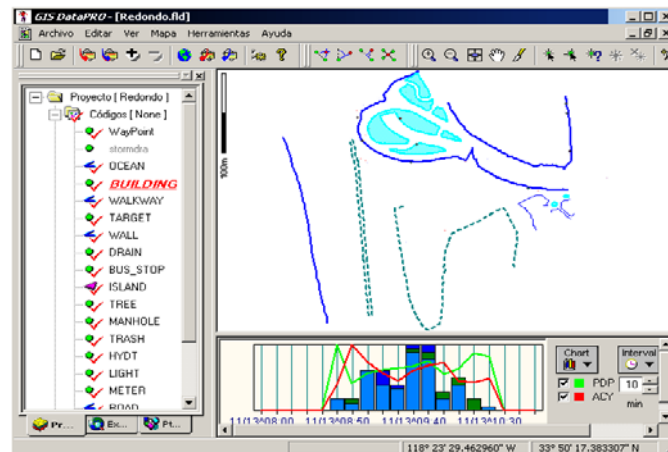
1 Introduction

Welcome to Leica GIS DataPRO Version 3.0.

GIS DataPRO software supports GIS data collection with Leica Geosystems GPS data collection systems the GS50 and GS20 PDM. This software is the link between GPS data collected with the GPS sensor and your GIS.

GIS DataPRO's functionality includes:

- ☐ GIS Data definition - Codelist Manager
- ☐ GPS communications - Data transfer
- ☐ Data import - GPS / Shapefiles / CAD
- ☐ Post-Processing - DGPS, Static, Kinematic
- ☐ Data editing/management
- ☐ Data export - GIS / CAD / ASCII
- ☐ Waypoint Management
- ☐ Generates GS20 Background Graphics
- ☐ Coordinate System Management



GIS DataPRO user interface

1.1 Software Protection

For users who purchased the **Differential Phase Option**, post-processing functionality is protected by a software protection key (dongle). The Differential Phase Option increases the accuracy of GPS to centimeter level. Without this key, you will not be able to post process L1 phase data using the Ski-Pro Wizard. All other functions will work without the use of a software protection key. For users who did not purchase the Differential Phase Option, the dongle is not necessary – the Ski-Pro Wizard will perform differential correction on rover data without it (processing down to sub-meter level of accuracy).

2 Installation

This brief chapter leads you through the process of installing GIS DataPRO.

System requirements:

The computer and system software you intend to use with GIS DataPRO must meet the following minimum requirements. Note that GIS DataPRO works best with these recommended requirements:

- Windows 98 SE, Windows NT 4.0 with Service Pack 6, or Windows 2000 with Service Pack 2 (or later) Operating System

Minimum Hardware requirements:

- PC with Pentium processor 90 MHz
- 32 MB RAM
- 150 MB free space on hard disk (for typical installation)
- RS232 COM port or USB Port (for Bluetooth data transfer, GS20 only)
- CD-ROM Drive
- Parallel Port (for Differential Phase Option software protection key)
- Mouse installed

Recommended Hardware requirements:

- PC with Pentium processor 200 MHz or faster
- 128 MB RAM
- 300 MB free space on hard disk
- Parallel Port (for software protection key)
- CD-ROM drive
- Mouse installed
- USB Port (for Bluetooth data transfer, GS20 only)
- PCMCIA Memory Card Reader

Operating Systems required revision levels:

- Windows 98 - Second edition or later
- Windows NT - Version 4.0 plus Service Pack 6
- Windows 2000 - Service Pack 2 or later
- Windows XP

2.1 Installing GIS DataPRO



Before you install:

Ensure that your computer and software conform to, at least, the minimum system requirements. GIS DataPRO requires at least 150 MB of free disk space. The programs on the installation CD are compressed and will be expanded during installation. GIS DataPRO is delivered on a CD-ROM.

will exclude help and example files, and **Custom** will give you the option of installing any component.



If you are installing GIS DataPRO over a previous version of the software you will need to uninstall that version prior to installing GISDataPRO V3.0. (See next page)

Installation

To install GIS DataPRO follow the instruction below:

- Insert the CD-ROM

If the Install Shield Wizard does not automatically appear, then follow these steps:

- From the WindowsTM Start bar, click Run
- Type d:\setup.exe (where d: is the CD-ROM drive indicator – your CD may be assigned a different drive letter.)

The Setup program prompts you through the installation process. Follow the instructions on the screen. You are given the following options to install: **Typical**, **Compact**, or **Custom**. **Typical** will install all the components, **Compact**

Bluetooth USB Dongle

It is recommended that you install GIS DataPRO software before connecting the Bluetooth USB Module. Drivers for Bluetooth module will be placed in the newly created GIS DataPRO directory.

- After installing the software, connect the Bluetooth module to a USB port.
- Follow the WindowsTM USB intall process.
- To select the driver browse through the GIS DataPRO CD, or the GIS DataPRO install directory and select SS1BTUSB.sys (C:\Program Files\Leica Geosystems\GIS DataPRO\Bluetooth\SS1BTUSB.sys)

2.1 Installing GIS DataPRO (continued)

Phase Dongle

In order to post process phase data using the GIS DataPRO, you need to use a hardware protection key (dongle) with the software. The Sentinel Dongle Driver is automatically installed when the GIS DataPRO installation is done. If there is an indication that the Dongle Driver did not install properly you can manually install it using the following instructions:

- Insert the GIS DataPRO CD into the CD-ROM drive.
- Open the Dongle Driver folder on the CD.
- Open the Driver538 folder on the CD.
- Double click on the Setup.exe file in that folder.

The Dongle should then be installed on the parallel port of your computer.

Users purchasing the L1 phase option will not be able to use the Ski-Pro wizard to post-process phase data without the Dongle driver properly installed. All other functions will operate normally without the dongle.

If a previous version of GIS DataPRO is already installed:

Before installing GIS DataPRO it is necessary to first uninstall any previous versions. Unique database information such as Projects, Waypoint Files and Coordinate Systems should not be deleted. However, all files originally created by GIS DataPRO may be overwritten. Therefore, users are urged to backup any important data contained within the program directory. This will in no way harm performance of this or any application, but will take up a considerable amount of disk space.



Do not delete any program files manually by using Windows Explorer or any other File Management program.

2.2 Uninstall GIS DataPRO

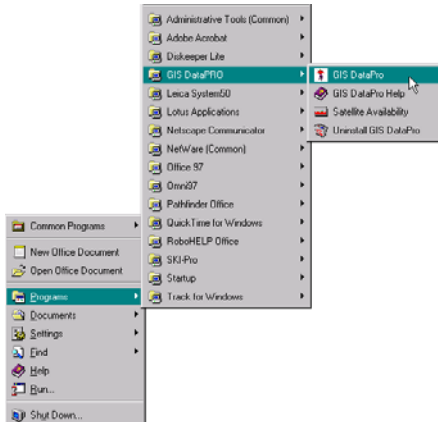
To delete the GIS DataPRO installation on your computer follow the instruction below:

- From the Windows™ **Start** bar, click **Programs**.
- Select **Leica GIS DataPRO**.
- Click **Uninstall GIS DataPRO**.
- Confirm with **Yes**. All GIS DataPRO files and settings will be removed permanently from the hard disk.

2.3 Starting and Exiting GIS DataPRO

To start GIS DataPRO:

- From the Windows™ **Start** bar, click **Programs**.
- Select **Leica GIS DataPRO**.
- Click **GIS DataPRO**.



Alternatively, you can double click on the Leica GIS DataPRO icon on your desktop.

To exit GIS DataPRO:

- From the **File** menu click **Exit**.

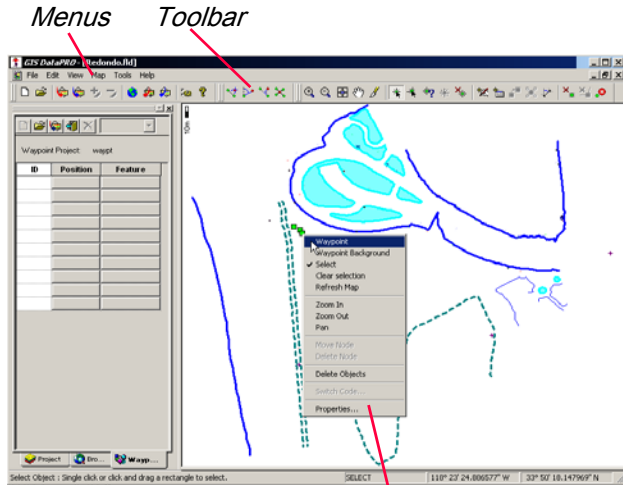
3 An Overview of GIS DataPRO

GIS DataPRO runs on the 32-bit Microsoft® Windows™ Operating Systems including; 98 SE, NT, 2000, and XP platforms. Because GIS DataPRO software is based on an intuitive graphical user interface (GUI), with standard Windows™ operating procedures, it is easy to learn and use.

If you are already familiar with Windows™ , you will find GIS DataPRO very easy to handle. Those with no prior knowledge of Windows™ will find it quick and easy to learn.

The various components of GIS DataPRO may be accessed using different methods. In fact, there are usually two or three ways to access any command in GIS DataPRO. As you grow more accustomed to the software, you may choose the tools which you prefer:

3.1 Software Navigation Tools



Tabbed Views Context-Menu

Menu Bar

The Menu Bar is a special toolbar at the top of the screen that contains the following menus:

File, Edit, View, Map, Tools, and Help. Additional commands are available under each menu. If a command is not applicable it is grayed out and not accessible.

Toolbar

Toolbars allow you to organize the most frequently used commands the way you want to, so you can find and use them quickly. You can easily customize toolbars - for example, you can add and remove buttons, create your own custom toolbars, hide or display toolbars, and move toolbars.

Context-Menu

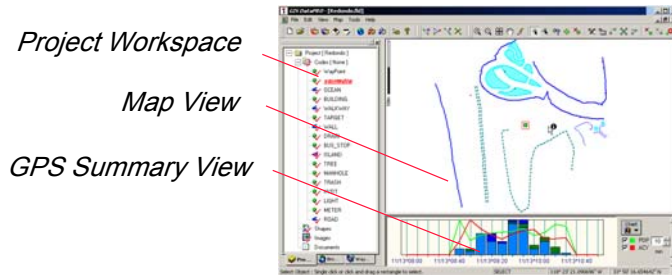
Almost everywhere, right clicking on an item in GIS DataPRO will provide a Context-Menu. A Context-Menu lists all useful commands at a particular instant for a particular item on the screen. It is possible to navigate through the entire software by only using commands from the Context-Menu.

Tabbed-View

Tabs at the bottom of the Workspace allow you to quickly select the Project Manager, Feature Browser, or Waypoint Manager.

3.2 An Overview of GIS DataPRO Windows - Views

GIS DataPRO consists of three main views (windows): the **Project Workspace**, **Map View Window**, and the **GPS Summary View**.



The **Map View** Window is the window on the top right hand side where the GPS data is displayed. As you scroll over the data in the Map View Window using the mouse, the coordinates of the current position are displayed in the lower right hand side of GIS DataPRO software.

The **Project Workspace** window is on the left hand side of the Map View. The Project Workspace is used to display specific information about data, including any codes and attributes (see Section "4.2 Creating Codelists"). The Project Workspace also includes the Project Manager, Feature Browser and the Waypoint Manager, which can be accessed by using the tabs at the bottom of the window.

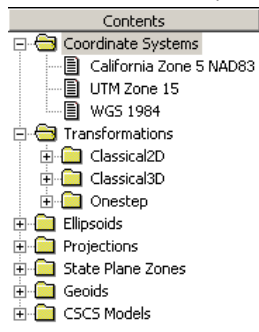
The **GPS Summary View** is the display below the Map View Window. The GPS Summary View shows GPS time, accuracy, and satellite geometry information on the day that the GPS data was collected. Time intervals are displayed using the bar graph. Light blue indicates point features, green indicates line features, and dark blue indicates area features. Moving the mouse over the top of any interval will display an information box which will tell you how many features were collected during that interval. Click on the Chart button to display PDOP and/or Accuracy information for the collected GPS data.

In addition to the three main windows, there are several other windows in GIS DataPRO which appear when different features of the software are accessed.

3.2 An Overview of GIS DataPRO Windows - Views (continued)

Tree-View Window

The Tree-View pane provides you with an overview of the items you are currently working with, in an expandable hierarchy of folders and pages. The Tree-View is used in components such as the Coordinate System Management and the Sensor Transfer tool (see Chapter "4 Project from Start to Finish" for more information).

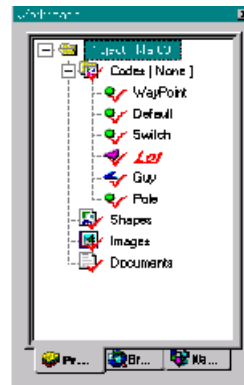


Double click on a folder or click [+] to expand (open) it. If a folder is open double click on it or click [-] to collapse (close) it.

Click on a folder or page to display the content of it. Depending on the type of data to be displayed the data will be listed in a Report-View or Property-View.

Explorer-View Window

The Project workspace allows user interaction using an Explorer-View, which is similar to Windows™ Explorer.

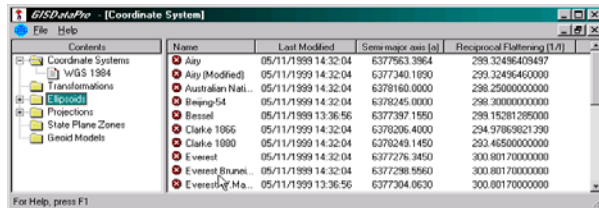


Other features within GIS DataPRO, such as the Coordinate System Manager, and the Codelist Manager, use Explorer-View consisting of two panes, a Tree-View on the left-hand side and a Report-View or Property-View to the right hand side.

3.2 An Overview of GIS DataPRO Windows - Views (continued)

Report-View Window

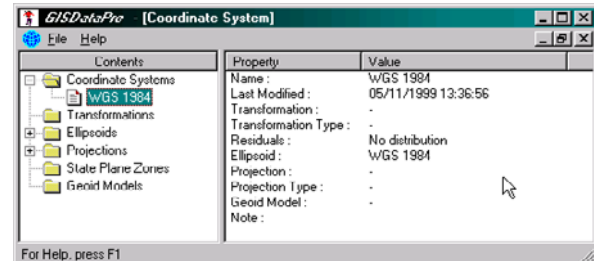
Database information such as ellipsoidal parameters may be listed in a Report-View. The data records are listed in rows and columns on the right hand side of the screen. Each row displays one record.



Property-View Window

Database information such as Project Properties may be listed in a Property-View. The information is listed in two columns. The first column lists the description (Property) and the second column lists the actual value. Property-Views are not user configurable.

The GIS DataPRO On-line Help System is a very comprehensive reference and includes detailed information about the entire software package.



3.3 Accessing On-line Help

Information **NOT** contained in this user manual can be found in the On-line Help System.

To display the On-line Help System:

- From the Help menu click Help Topics
- Click the Contents Icon
- Click the Index Icon



The Help Topics property sheet appears. All topics contained in the Help are listed in books and pages .

- Double click on a book to open it . A book may contain pages or other books .
- Double click on a page to open the help text.

To find a topic in the Help:

- Click the Contentsw tab to browse through topics by category.
- Or, click the Index tab to see a list of index entries: either type the word you're looking for or scroll through the list.
- Or, click the Find tab to search for words or phrases that may be contained in a Help topic.

To print Help text:

- If the Contents tab isn't already displayed, click on Contents.
- Select the book or the page that you want to print.
- Click on the Print button.
- Make sure the printer information is correct.
- Select OK to confirm.

For more information about the On-line Help System refer to Windows™ help by selecting Help from the Start menu.

4 Project from Start to Finish


This chapter is designed to guide users through the essential features of GIS DataPRO software. Each section will step through the fundamentals of the software. From creating projects and codelists, to transferring, post-processing, and editing data; the sections are designed to follow a sequence of steps that a user might perform before and after collecting GPS data in the field.

4.1 Creating Projects

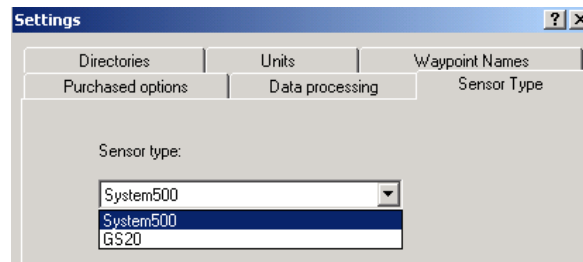
After data has been collected in the field using the Leica GPS receiver, the raw GPS data will need to be transferred to GIS DataPRO software. All collected GPS data that belongs together can be organized in GIS DataPRO so that everything is stored in one common place, or single project.

Setting a Sensor Type

GIS DataPRO supports both the System 500 and the GS20 GPS sensors. It is important to specify the sensor type first. To set the sensor type in the General settings...


- From the Tools menu, choose the General Settings icon. Alternatively, you can select the Settings icon from the toolbar. 

Setting the sensor type in General Settings ensures that the next project created will have the specified sensor type. Also, changing the sensor type under File, Properties will change the sensor type for the current project and update the General Settings to the new sensor type.



Starting a New Project

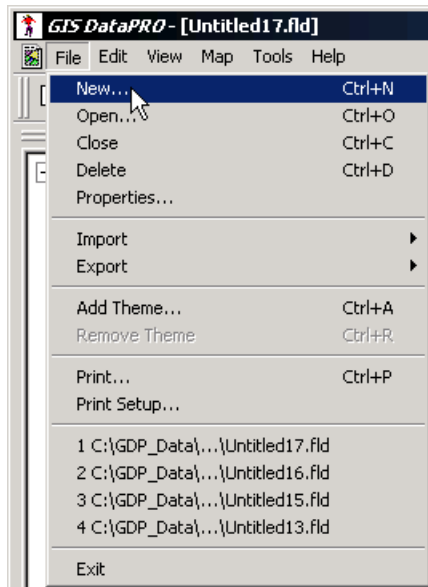
Before transferring data to or from GIS DataPRO, it is important to set up a project. To start a new project...

- Double click on the Leica GIS DataPRO icon on the desktop. 
- Go to the File Menu, and choose New, or click on the Toolbar button.

This will bring up the **New Project** dialog box.

- Choose a name for your project and type it into the space provided under Project Name.

4.1 Creating Projects (continued)

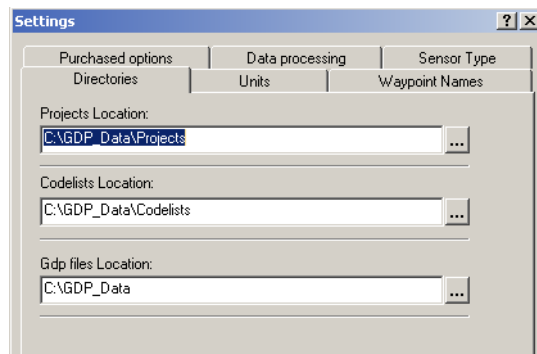


This will create a directory where all your GPS field data files will be stored. If you don't name your project, GIS DataPRO will assign a default project name of 'Untitled' to the project.

When creating a new project a coordinate system must be assigned to it. In the **New Project** dialog click the coordi-

nate system tab to select from the available coordinate systems. (See section "4.3 Coordinate System Management" for more information on Coordinate System Management)

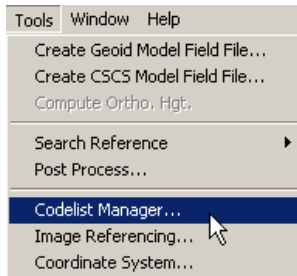
The on-disk location where the project directories are created and where data is stored can be accessed and changed from the general settings dial (Tools/General Settings)



Each time the GIS DataPRO software is started, it will open the most recent project.

4.2 Creating Codelists

Leica GPS systems collect GIS data in the form of “codes”. Codes can be thought of as layers or themes in GIS terms. A code represents an independent data layer that contains geographic features and their attributes. A codelist is a collection of codes. It is an empty catalog or database schema that can be transferred to the GPS unit. The codelist is designed for collecting features and/or codes (points, lines, and areas), and descriptive information about them. Codelists are used outside in the field when the GPS data is collected.

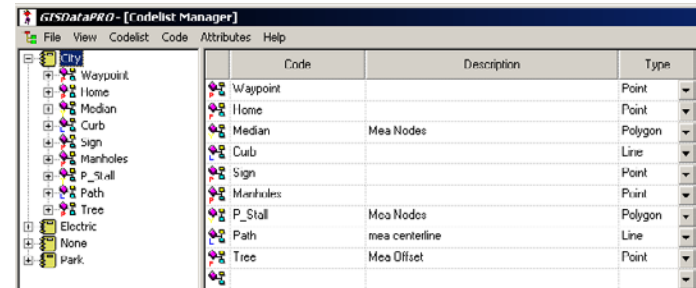


Before going into the field, try to visualize all of the types of features you need to collect (light poles, fire hydrants, trees, manholes, streets, land parcels, etc.). Will these codes be classified as points, lines, or areas? Each of

these feature types becomes a code in your codelist. If you encounter something, in the field, that you didn't think of, you can add that to the codelist in the field. Next, think of what you want to know about the features you are going to collect. Include these as attributes of the codes and include them in the codelist.

To create a codelist:

- From the Tools menu, choose Codelist Manager.



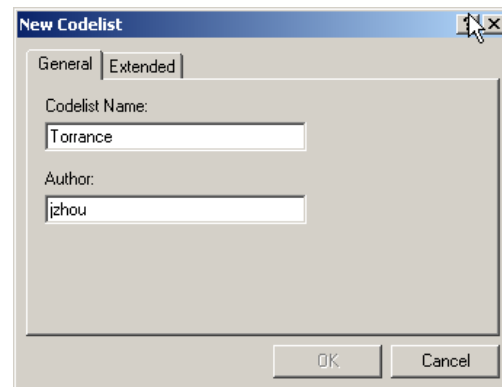
With the Codelist Manager open, some sample codelists will appear on the left hand side. Expand one of the codelists by clicking on the plus next to one of the folders. Inside you will find features set up as either points, lines, or

4.2 Creating Codelists (continued)

areas. These samples can give you an idea of how to set up features and attributes.

- To create a new codelist, right click on the left window and choose **New Codelist** from the pop-up context menu. Another option is to choose New Codelist from the Codelist menu.

The **New Codelist** dialog should appear. Enter the new codelist name and your name in the appropriate input boxes.

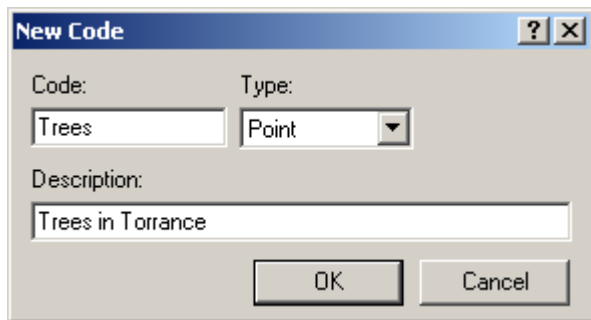


The new codelist should now appear in the left hand window. All codelists will be created with a Waypoint code as a default code. The `it_name` and `it_Z` attributes listed first are default attributes that can not be changed. The `it_Z` attribute contains elevation data. and the `it_name` will be used to store internal ID's.

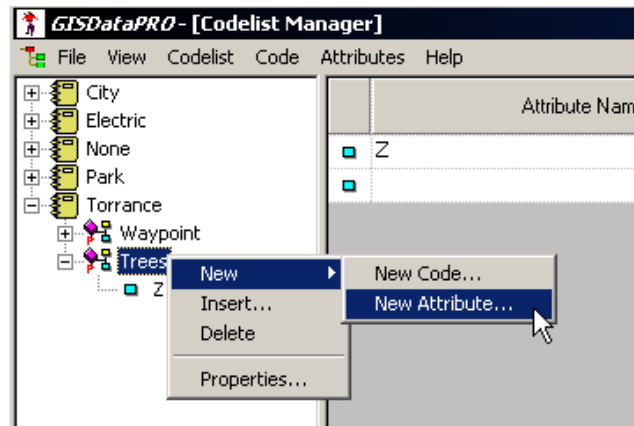
4.2 Creating Codelists (continued)

To add codes:

- Select **New Code** from the Code menu.



- Once you have named a new feature code, and designated it as a point, line, or area feature, you will need to assign attributes to it. Using the mouse, highlight the code on the left hand side, right click and choose **New Attribute**.

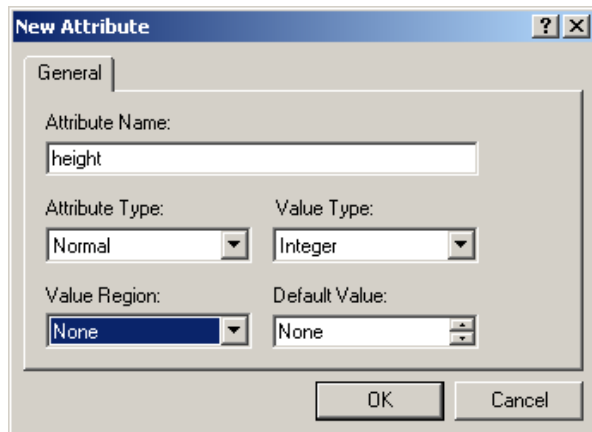


- In the **New Attribute** dialog box, you have several choices. Fill in an appropriate attribute name. For example, if you created a new code named Tree, then you might add Species, and Height as attributes of that code.



New Attributes can also be added by clicking in the blank row on the right hand side of the Codelist Manager (looks like a spreadsheet).

4.2 Creating Codelists (continued)



The 'New Attribute' dialog box, General tab, shows the following fields:

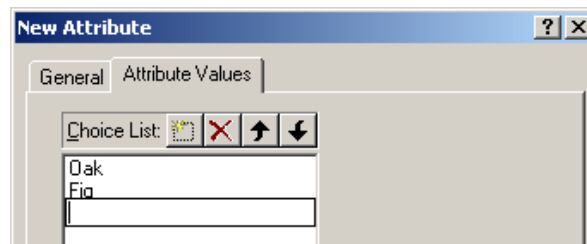
- Attribute Name: height
- Attribute Type: Normal
- Value Type: Integer
- Value Region: None
- Default Value: None

Buttons: OK, Cancel

- After typing in the attribute name, define the type of attribute from the pull down menu – Fixed, Normal, or Mandatory.

Normal means that the information for that attribute can be filled in or left blank by the user in the field. A 'fixed' attribute will not be displayed in the field sensor – it will only be displayed in the office software. **Mandatory** means it must be answered in the field by the user. A feature cannot be collected without filling in a mandatory attribute.

- Next decide on the value type, whether it is a Real number, Text attribute, or an Integer. (In the tree example, species would be text, and height would be an Real)
- In the Value Region box, decide if your attribute can be in the form of a Choice list (a pulldown list of choices), or other values range. Value ranges only apply to numeric attributes. If not, select None.
- In the next box you have the option of entering a Default Value that will appear for this attribute (the most common choice, for instance).
- If your attribute is a choice list, click on the Attribute Values tab. Click the enter icon where it says **Choice List**. Enter the names of the choices for your attribute values (ex. elm and oak for tree species).



The 'New Attribute' dialog box, Attribute Values tab, shows the following fields:

- Choice List: [Choice List icon] [X icon] [Up arrow icon] [Down arrow icon]
- Oak
- Fia
- [Empty text box]

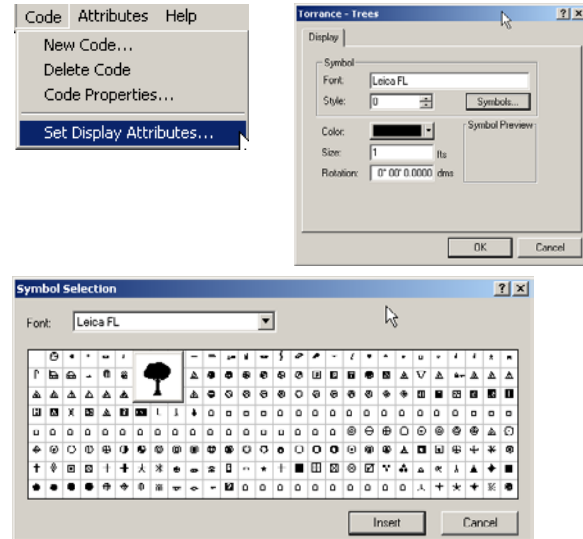
4.2 Creating Codelists (continued)

Setting and Creating Display Attributes

After creating your codelist with the appropriate codes, You can define the display attributes. These properties control the graphic depiction of features in the GIS DataPRO mapviews.

After highlighting a code:

- Choose **Set Display Attributes** from the Code menu
- Press the Symbol button to display your choice of symbols.
- Choose your symbol and press Insert.
- Set the symbols color and size in the appropriate boxes and press OK.
- Repeat these steps for each code in the codelist.



Saving your Codelist

After creating a codelist, you can save it to the hard disk and then upload it to the GPS system.

- From the File menu, choose Save.
- From the File menu, choose Close to close the dialog box.

4.2 Creating Codelists (continued)

Your codelist should be saved on the hard drive, under the appropriate project folder, in the following location:

...\GDP_data\Codelists\



You can also import code and attribute definitions into codelists directly from existing shapefiles. Please consult the On-Line Help for more information.

4.3 Coordinate System Management

The basic function of the Global Positioning System is to give coordinates at any point on the earth's surface. To do this, GPS uses a geodetic coordinate system based on the WGS84 ellipsoid. An ellipsoid (also known as a spheroid) is a sphere that has been flattened or squashed. A point on the surface of the earth read by GPS can be defined by using Latitude, Longitude and ellipsoidal height.

GIS DataPRO software allows for GPS data taken in WGS84 to be transformed into other coordinate systems that may be attached to a Project in GIS DataPRO.

A coordinate system is a reference system, or grid, overlaid onto the earth's surface. Coordinate systems are used for referencing and recording locations on earth. A Coordinate System provides the information necessary to convert coordinates to different representations. There are many coordinate systems, but three of the most common are: Latitude/Longitude (also called geographic), UTM (Universal Transverse Mercator), and State Plane. Latitude/longitude is a worldwide reference system, while UTM is used primarily within the U.S.A., and state plane is used at the local level (by counties, and cities).

In addition, certain coordinate systems can use particular units. Generally, Latitude and Longitude is measured in decimal degrees, or degrees, minutes seconds, for example:

30° 28' 07.73" N (latitude)

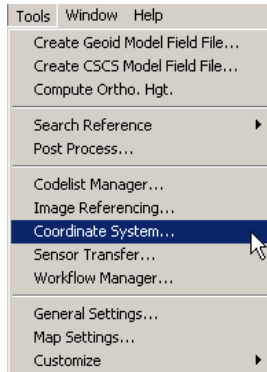
97° 49' 42.27" W (longitude)

UTM coordinates are measured in meters, and State Plane coordinates are measured in feet or meters.

Some coordinate systems apply datums. Each datum gives a different representation of the earth's shape. Latitude and longitude is measured in the WGS84 datum, which stands for World Geodetic Survey 1984. The UTM coordinate system is typically measured in NAD83 datum, which stands for North American Datum, 1983; while State Plane can be measured in NAD27 (1927), or NAD83. Either datum can be used with state plane, however NAD83 is more accurate.

4.3 Coordinate System Management (continued)

Regional datums conform to the geoid in a region, rather than the whole globe. The geoid is a model of equipotential gravimetric surface, taking into account gravity measurements, which essentially describe mean sea level (MSL). All GPS data is collected in latitude/longitude WGS84, and height above ellipsoid (HAE).



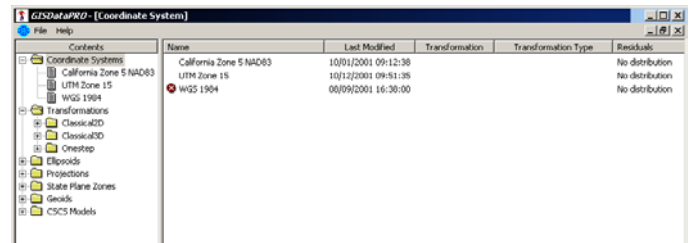
Setting up a Coordinate System

To set up a coordinate system in GIS DataPRO,

- Go to Tools, Coordinate System. The GIS DataPRO application window will turn into the Coordinate System Manager.

- Click with the mouse to expand the plus sign next to Coordinate Systems to expand the folder.

Inside, you will find WGS84, which is the datum for the latitude/longitude coordinate system. You may choose this coordinate system (or any others that are loaded), or create your own. The ellipsoids, projection, state plane zone, geoid, and CSCS (Country Specific Coordinate System) can be assigned in the same manner.



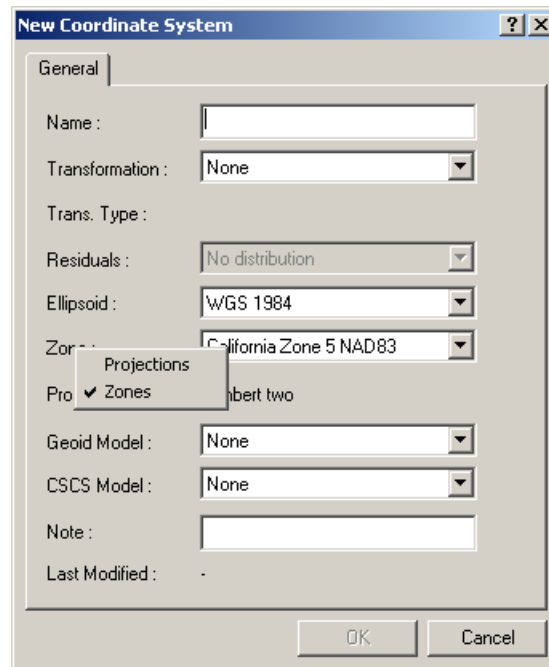
A coordinate system must be assigned within GIS DataPRO before a project can be opened.

4.3 Coordinate System Management (continued)

Creating a new Coordinate System

To create a new coordinate system,

- Right click on the plus sign and choose New from the menu. The **New Coordinate System** dialog box will come up and you will be prompted to name the new coordinate system.
- If appropriate choose the Transformation, which is the datum shift from the current coordinate system.
- Choose an Ellipsoid
- If you choose to work in the UTM coordinate system and you must select **zone** instead of **projection**, move your mouse over the word Projection and left click. There should be a check by the word Projection. Click on the word Zone to change the menu choice from projection to zone, and fill in the appropriate UTM zone.
- Finish out the box by filling in the Geoid Model and CSCS* (see page 27) if needed.
- Press OK.



4.3 Coordinate System Management (continued)

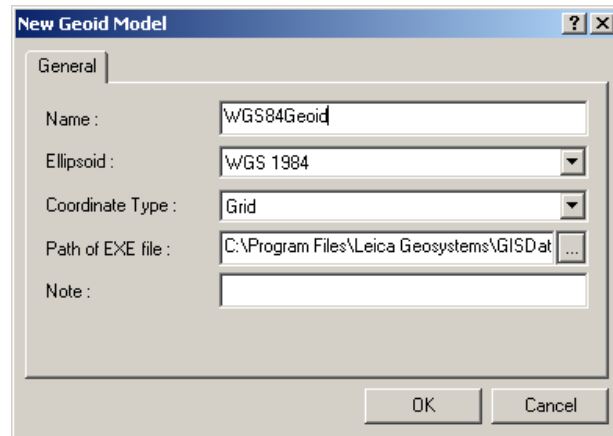
Geoid Models

The Geoid Model can be filled in by using existing files provided by GIS DataPRO. Right click on the expandible Geoid folder on the left side of the Coordinate System Manager. Choose New. Fill in the Name, Ellipsoid, and Coordinate Type of geoid you wish to use. The name can be anything you choose, it does not have to be coordinate specific.

Click on the button to the right of the box that says 'Path of EXE file' to see a list of files. Press OK.



The geoid files that come with GIS DataPRO can be loaded from: c:\program files\Leica Geosystems\GIS DataPRO\geoid. You can choose from either the North America or Standard folders. Navigate down through these directories until you find an .exe file that you can use. The file geoid99.exe under c:\program files\Leica Geosystems\GIS DataPRO\ geoid\North America\Geoid99\ contains all geoids for North America. When you apply this to your project, you can compute orthometric height, or elevation data.



Projections

Projections are used to convert map coordinates when transferring from a 3D surface to a 2D surface (globe to a map), or from one projection to another. To create a Grid Projection, right click on Projection and select New. Enter Name, Type, False Easting, False Northing, and Central Meridian.

4.3 Coordinate System Management (continued)

Transformations

To create a transformation, right click on Transformations and click New. Name the coordinate system. Choose Ellip A, Ellip B, and Model. Two selections are available – Classical 2D and 3D. 2D transformations allow for a XY grid shift, rotation and scale (no z, or height). When you exit the Coordinate System Manager (File, Exit Coordinate System Manager), any changes you have made, and whatever coordinate system you have selected will be saved and used by GIS DataPRO.

In GIS DataPRO, you can create a **Geoid Model Field File** to be used in the GPS sensor. The field file is a clipped grid of the Geoid based on user defined extent (See on-line help for more information). After the coordinate system and geoid have been saved, they can be transferred to the sensor.



The advantage to defining a Coordinate System with a Geoid in GIS DataPRO before going into the field is that you can then see Geoid elevation readings in the field (vs WGS84 ellipsoid heights), as well as local grid coordinates and units (vs. latitude longitude).

CSCS

*CSCS = **Country Specific Coordinate System**.

Several countries have produced tables of conversion factors to directly convert between GPS measured coordinates given in WGS84 and the corresponding local mapping coordinates, taking the distortions of the mapping system into account. Using these tables it is possible to directly convert into the local grid system without having to calculate your own transformation parameters.

Country Specific Coordinate System Models (CSCS Models) are an addition to an already defined coordinate system, which interpolates corrections in a grid file and applies the interpolated corrections. The extra step of applying these corrections can be made at different positions in the coordinate conversion process. Therefore, different methods of CSCS Models are supported. (See on-line help for more information on conversion methods)

CSCS Models may also be used on the receiver in the field. Go to Tools, Create a CSCS Model Field File menu and then upload the file using the Sensor Transfer tool. (See Section "4.4 Transferring Data to/from the GPS Sensor" for more information.)

4.4 Transferring Data to/from the GPS Sensor

There are several different methods of transferring data to and from the GPS sensor, the PC, and the GIS DataPRO software. Using the Sensor Transfer tools in GIS DataPRO, data can be transferred wirelessly via Bluetooth (GS20 only), via serial cable (RS-232), or written directly to the compact flash (PCMCIA for System 500). Also, without the DataPRO software, files can be transferred to and from the compact flash card by using Windows Explorer to transfer data.

Sensor Transfer and GIS Data Handler

The Leica GIS Data Handler interface is new to GIS DataPRO 3.0 and is an explorer style interface for sensor transfer. The GIS Data Handler interface is accessed via TOOLS>Sensor Transfer on the main GIS DataPRO 3.0 toolbar, and can also be run as a standalone application. The standalone application may be accessed from START>LEICA GIS DATAPRO>GIS DataHandler.

In GIS DataPRO 3.0, the GIS DataHandler provides an all new interface and many improvements to the former Sensor Transfer functionality.

Installation of the USB Bluetooth Module

☞ USB is not compatible with Windows NT.

Installation of the USB Bluetooth Module for data transfer between the GS20 and GIS DataPRO is only for the initial setup and will not have to be repeated.

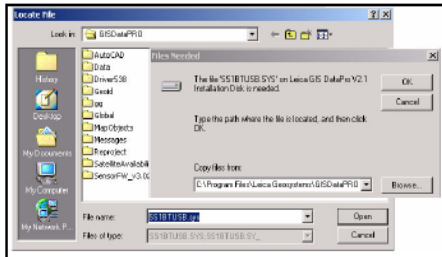
First, install GIS DataPRO 3.0 now, if it is not already installed, Then, follow these steps:

- Plug in the USB Bluetooth Module. Windows will bring up a “Found New Hardware” dialog.
- Windows will then ask for the location of the Device Driver (SiW).



4.4 Transferring Data to/from the GPS Sensor (continued)

The driver we are looking for is SS1BTUSB.SYS and may be found in the ../Program Files/Leica Geosystems/GISDataPRO directory; select Browse to find the file. (The file is also available on the GIS DataPRO 3.0 installation CD.)



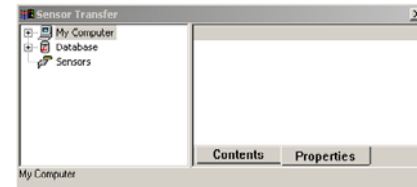
- Install using the Leica driver, “SS1BTUSB.SYS”.

Once you have the Bluetooth driver installed, we are now ready to configure the virtual port.

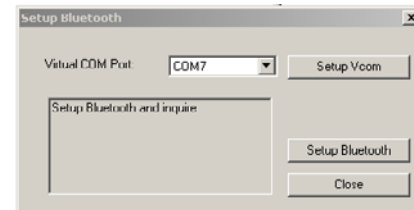
Setting up the Virtual Port and Bluetooth

To communicate with the GS20 via Bluetooth we must configure a virtual COM port and enable Bluetooth communication. To configure the virtual port, we will need to open GIS DataPRO.

- Open GIS DataPRO and select TOOLS>Sensor Transfer from the main toolbar. This will load the new GIS DataHandler interface.



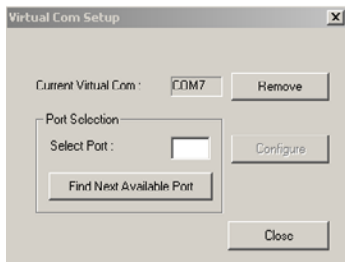
- In the dialog, highlight SENSORS icon near the bottom of the directory tree on the left. Right click on Sensors and select “Setup Bluetooth.”
- This will open the **Setup Bluetooth** dialog.



- In the **Setup Bluetooth** dialog, an empty “Virtual COM port” choicelist indicates that no virtual COM port has been setup yet. (If a virtual COM port is listed then it

4.4 Transferring Data to/from the GPS Sensor (continued)

does not need to be setup) To set one up click the select “Setup Vcom” button.



- In the Setup Virtual Com dialog select the “Find Next Available Port” button. (If a VCOM port already is listed, first REMOVE that one before setting up the new one.)



GIS DataPRO 3.0 searches ports 5-10 for the Virtual COM port.

- This will report back the next available COM port. Click the Configure Button to accept the COM setting.
- Now, with a Virtual COM port configured, select the “Setup Bluetooth” button from the Setup Bluetooth Dia-

log. GIS DataPRO will then instruct you to go into the GS20 and perform the bluetooth inquiry.

GS20 Bluetooth Inquiry

For the GS20 to communicate with GIS DataPRO via bluetooth it must first define the link between the devices with a Bluetooth inquiry. The following instruction are for the GS20 are for Firmware build 1.15, (For more information on using the GS20 consult the GS20 user manual)

- Within the GS20. select: from the main menu Setup> Hardware Management>Wireless>Bluetooth>Sensor Transfer and **Inquire**.

The GS20 will search for Bluetooth devices in the area and return a list of a addresses for the Bluetooth devices. Select the correct device from the choicelist.

- In the GS20, Select MENU and SAVE to save the address.

GIS DataPRO and the GS20 are now prepared to communicate by Bluetooth.

- Close the **Setup Bluetooth** dialog.

4.4 Transferring Data to/from the GPS Sensor (continued)

Adding the Sensor to Transfer Data

To use the Data Handler interface to transfer data between the GPS sensor and your computer, the GPS sensor must be **added** to the directory tree of the software.

- From the main menu of the GS20 go to Utilities>Sensor Transfer

Ensure that the “Port” selected is correct, Either the Bluetooth Virtual COM, or COM 1 for a serial cable.

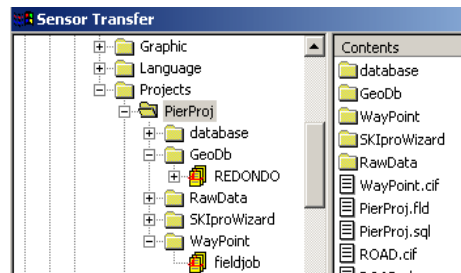
- Highlight the SENSORS icon near the bottom of the directory tree on the left, right click and select ADD SENSOR. This will open the SENSORS dialog.
- Check that displayed in the SENSORS dialog is the configured Port. Select OK.

GIS DataPRO will read the connected device. You will see progress bars followed by the appearance of the GPS sensor icon with “System” and “PC card” sub-folders.

Leica Objects Versus Files and Folders

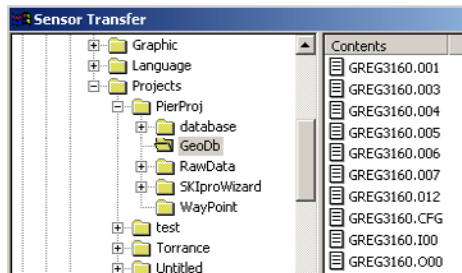
In the Data Handler interface, the contents of the directory tree can be viewed in one of two ways. By default the data is viewed as Leica objects, but it can also be viewed as normal files and folders. For example, compare the contents of the GeoDB directory of this GIS DataPRO job.

When viewed as a Leica object, the job is a single icon.



4.4 Transferring Data to/from the GPS Sensor (continued)

When viewed as files and folders, the files that comprise a Leica Job are visible.



In Sensor Transfer, you can transfer various Leica file types to and from the GPS sensor, including:

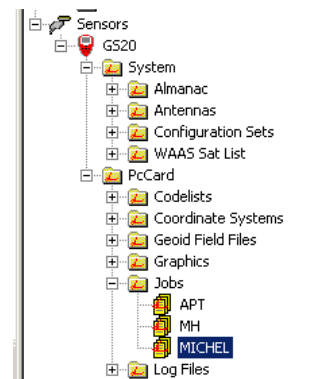
- 1) GPS Jobs
- 2) Antenna files.
- 3) Configuration Sets.
- 4) WAAS Satellite Lists.
- 5) Geoid Field Files.
- 6) GS20 Background Graphics.

Transferring and Importing GPS Job Data

With GIS DataPRO 3.0 and the DataHandler interface, it is now possible to transfer collected GPS data and Import the data directly into the current DataPRO project. Once the sensor has been added to the Sensor Transfer dialog you are ready to import your job.

To transfer raw GPS data from the sensor and import it directly to your current GDP project:

- In the jobs directory of the PC-card of your sensor, right-click on the job you'd like to import.



4.4 Transferring Data to/from the GPS Sensor (continued)

- Select **Import to Current Project** from the menu
- A dialog will confirm that you want the job files placed in the Raw Data directory of your current project. Click OK.

After transferring the raw data to your project directory the software will automatically generate shapefiles and add the data to your current DataPRO project.

Transferring Data FROM the sensor

To transfer data from your GPS sensor to your computer, select the Leica data object from the directory tree of the sensor, right-click on it, and select **Send To...**

This will open the **Transfer Files** Dialog. A browse button is available to place files in the location of your choice.

Transferring Data TO the Sensor

To transfer data to your GPS from your computer, navigate to the file in the Directory Tree. Right-Click on the object and select Send To...



The PC Card options in this dialog supports the transferring of data to the Sensor's flash memory card when it's plugged directly into the PC.

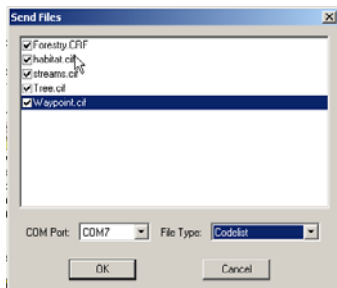
Transferring Multiple Files and Firmware

In some cases you may want to transfer several files to the GPS sensor at the same time. In the case of a GS20 firmware upgrade there are several separate files that need to be uploaded. A dialog is available to support sending multiple to the sensor.

4.4 Transferring Data to/from the GPS Sensor (continued)

Transferring Multiple Files from PC to GPS sensor

- In the directory tree navigate to the folder containing the target files.
- Right-Click on the object and select Send Files. The **Send Files** dialog will open.
- Check the files you want to send
- Identify the **File Type** of the files you want to send.
- Ensure the correct COM Port is selected.
- Click OK.



The files will be sent to the unit and placed in the appropriate directories based on the type of file you sent.



You can only send one type of file at a time. For firmware files there are several different file suffixes including; .znc, .bin, .doc, and .jpg, but they are all part of the “Firmware” type and should be sent at the same time.

Drag and Drop

GIS DataHandler allows the user to drag and drop data to and from the GPS sensor and the connected PC. The drag and drop functions will bring up the same dialogs as the Send menu options.

Simply select the file of interest, and drag the data into a folder elsewhere in the directory tree. This will transfer the file.



In the case of GPS jobs dragged to GIS DataPRO project directories will be added to that project.

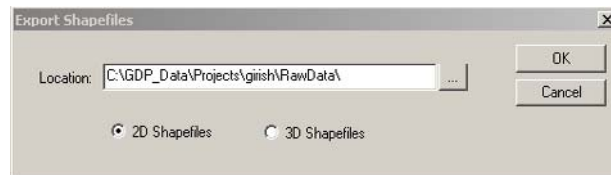
4.4 Transferring Data to/from the GPS Sensor (continued)

Direct Creation of Shapefiles

The DataHandler interface also allows the direct creation of shapefiles from raw GPS Job data without having to bring the data into a GIS DataPRO project, and will support the creation of both standard and 3D shapefiles.

In order to create a shapefile directly:

- First, the data must be transferred from the GPS Sensor to your PC. Transfer the GPS job data from the sensor to the directory of your choice.
- Navigate the directory tree to the GPS job you just transferred, right click on the job and select **Convert to Shapefiles**.
- This will open the Export Shapefiles dialog and the user will then select 2D or 3D shapefile. The user also has the option of accepting the default path to which to write the shapefile, or navigate to a new directory by clicking the browse button.
- Click OK.



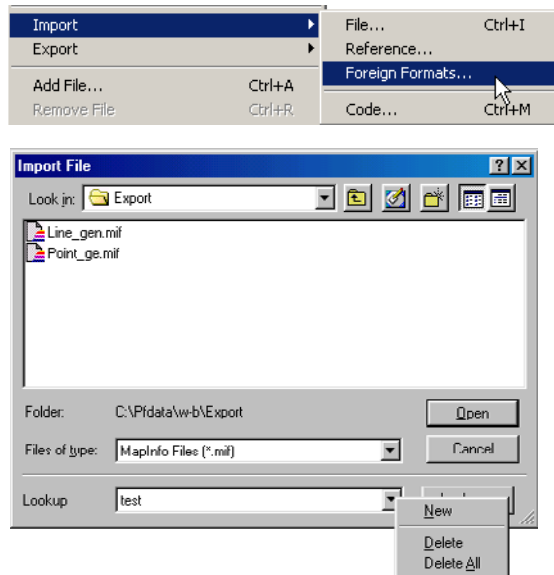
4.5 Importing Data from your GIS or CAD

Many users will want to bring in data from a GIS in order to display background files underneath collected GPS data. Another advantage to importing CAD or ESRI shapefiles is that they can be edited within GIS DataPRO. Aside from shapefiles, GIS DataPRO can accept data imported from a GIS in the following formats:

- AutoCAD DXF
- AutoCAD DWG
- Microstation DGN
- MapInfo MIF

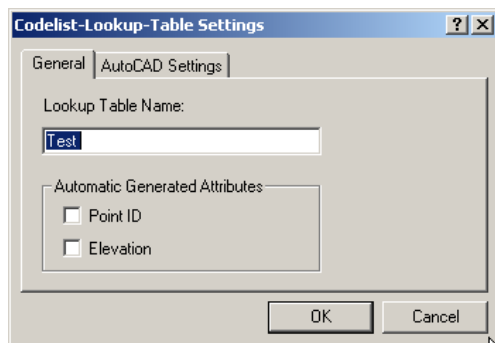
Before data can be imported, a lookup table must be created. A lookup table tells the import module which attributes to import from the GIS or CAD. To create a lookup table:

Go to File, Import, Foreign Formats. This brings up the **Import File** dialog box. At the bottom of the dialog box, there is a drop down menu button next to the word Lookup. Right click over the drop down menu to bring up a small menu.



Choose New and another small box will appear. Type in a new name for the lookup table.

4.5 Importing Data from your GIS or CAD (continued)



Click on the attributes that you would like to have automatically generated in the new table: Point ID and Elevation. Click on the AutoCAD Settings tab to select the AutoCAD Template File. You may use the default.dxf provided by GIS DataPRO or create your own.



The Template file is created in AutoCAD which may include variables such as a list of layers, line types and text styles which you will not have to set up again when loading and creating drawings. A lookup table will be created automatically.

Now you are ready to import data. Choose Import, Foreign Formats from the File menu. Navigate to the appropriate directory where the data is stored and then choose the correct type of import file in the Files of type drop down list. Press Open. GIS DataPRO will proceed to process the current code table. A dialog showing this progress will appear.

You may choose to import only specific attributes for each feature by modifying the Lookup table. You can access the Lookup table (after creating it) by pressing the Lookup button from the Export, Foreign Formats, or Import, Foreign Formats dialog box. Please consult the on-line help for more details.

When importing data from AutoCAD, Microstation, or Map-Info, the coordinates must be available in a Local Grid system, as AutoCAD does not recognize geographic latitude/longitude coordinates. The current project's coordinate system must also be the same as the imported CAD files.

4.5 Importing Data from your GIS or CAD (continued)

Importing Shapefiles

You can bring shapefiles into GIS DataPRO in two ways: Import File, to bring the data in as an editable code, and Add File, to bring the data in as a background layer.

To import a shapefile, choose File, Import, File. The shapefile must be in either Geographic/WGS 84 coordinate system or the same coordinate system specified as the current project.

To add a shapefile, simply choose File, Add File. Adding a shapefile will bring the shapefile in as a background image. This file is not editable.

Adding Images

Images can also be loaded in the background and referenced when required. Using this tool, users can create image maps for GIS DataPRO projects from image data sources, including scanned aerial photography, scanned paper maps and satellite imagery from industry standard sources. For images to line up with geographic data, the imagery must be geographically referenced and have the accompanying world file.

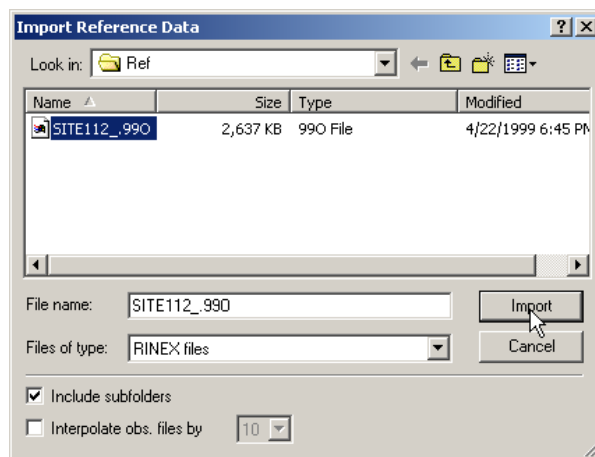
4.6 Importing GPS Reference Data

GPS data can be corrected in real-time in the field, or it can be post processed. Post-processing can be performed using the SKI-Pro Wizard available under GIS DataPRO post processing. To post-process, first a reference (base station) file will need to be imported. One option is to import this file manually, by locating it and downloading it from the Internet, another base station, or other sources. The reference file can be saved anywhere on the hard disk. Or, you can use GIS DataPRO's Automatic File Search feature to locate and import the appropriate file either from your network or from the Internet. (This section describes methods for importing reference data for more information on using other features of the SKI-Pro wizard see section "4.7 Using the SKI-Pro Wizard to Post Process Raw GPS Data")


Manual Import

To import the reference file manually, outside of the SKI-Pro wizard:

- Choose Import, Reference from the File menu, or click on the button from the toolbar.
- Select your reference file.



4.6 Importing GPS Reference Data (continued)

- If the file you have downloaded off the Internet is compressed (zipped - a.zip file), then you will need to unzip it prior to using it in GIS DataPRO, which does not recognize a .zip file extension.
- Click on the Reference Search Engine icon  from the Ski-Pro wizard.

Alternatively, you can choose the Tools, Search Reference on LAN menu item. The **GPS Reference Search Engine** dialog will appear.


- Check the **Include Subfolders** checkbox if you would like to import all raw data in the sub-directories in one step.
- Click Import to begin importing data.

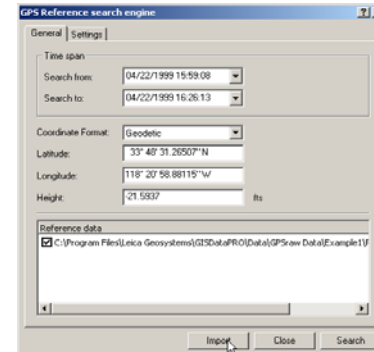
Automatic Reference File Search

The Automatic Reference File Search feature will locate, download and import the appropriate reference file required to post process your data. There are two searches available: Local Area Network (LAN) Search, and Internet Search.

Local Area Network (LAN) Search

To use the LAN search:

- First open the SKI-Pro wizard by selecting Tools>Post Process, or by selecting the  icon.



After setting the parameters and identifying the directories to be searched:

- Click Search to begin the LAN search.

4.6 Importing GPS Reference Data (continued)

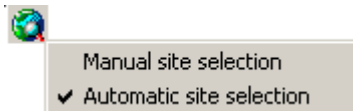
The search engine will return all matching files to the Reference Data textbox.

- Use the checkbox beside the file name to check the file you wish to import.
- Click Import to import the file.

GPS Reference Search: Internet

Set Manual or Automatic Site Selection:

- In the Ski-Pro wizard, right-click on the Internet GPS Search button to choose Manual or Automatic Site Selection.



Alternatively, you can choose the Tools, Search Reference, Internet from the menu.

The **Download** dialog will appear.



The rover file must be loaded prior to using the Automatic Internet Search. The search will automatically locate the ten closest reference files, using the rover file as a guide.



Any proprietary dial-up program, such as AOL, must be started manually before using the Internet search feature.

For Manual Site Selection:

- Choose a site to download from the Available Sites drop-down box.
- Set the remaining parameters.

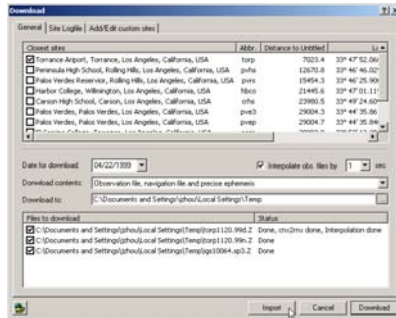
For Automatic Site Selection:

The search engine will return all matching files to the Files to download textbox.

- Check the checkbox beside the file name to specify the file you wish to download.
- Click Download to download the file from the Internet.

4.6 Importing GPS Reference Data (continued)


- Click Import to import the downloaded file into the project.
- In the automatic download dialog the Add/Edit custom site tab allows the user the capability to create additional Reference stations.



These new stations can then be accessed by way of the manual site selection list.

- For customization of data format specification in the URL string, please refer to the online help topic Internet Download: Add/ Edit custom sites

In GIS DataPRO, additional functionality has been placed inside the Internet Reference Wizard. These new features greatly enhance the users ability to control where, how, and what reference data is imported.


- In the automatic download dialog within the SKiPro wizard, Click the Update Reference Station button  and GIS DataPRO will retrieve the current list of available Reference Stations from the Leica web site.

The Site Logfile provides information specific to the chosen reference station.

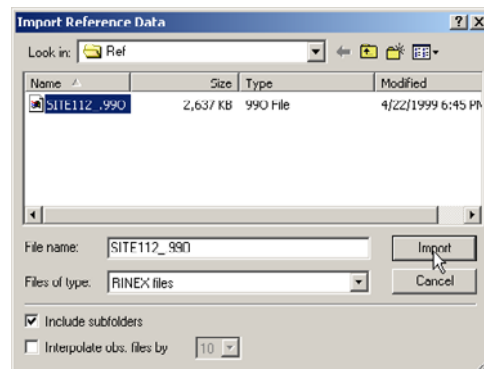
4.7 Using the SKI-Pro Wizard to Post Process Raw GPS Data

If you have collected any uncorrected GPS (rover) data in the field, the data can be post-processed using the SKI-Pro Wizard in GIS DataPRO. If data was differentially corrected in real time, you do not need to proceed with this step.

Before you can use SKI-Pro Wizard to post-process, load the raw data (rover file), and the reference (base station) file first. (File, Import, File and File, Import, Reference, respectively). When the Import Reference Data dialog box opens, you will see a drop down menu next to the words “Files of type.” Any reference files that were recorded using a Leica GPS receiver will be in GPS200, GPS300, or GPS500 raw data format. GIS DataPRO can also post-process rover files using RINEX format, which is an interchangeable (across platforms and manufacturers) GPS data file. Highlight the reference file that you want to bring in and press Import.

 When importing raw GPS data, remember to check the “Generate GPS measurement database” for post processing.

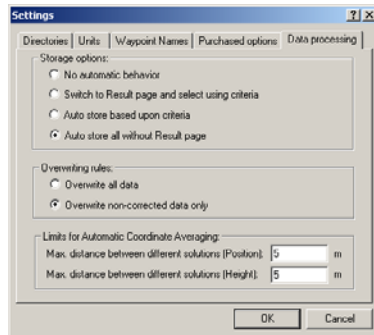
There are two options on the **Import Reference Data** dialog box - Include Subfolders and Interpolate observation file by (an interval). If **Include Subfolders** is checked then all raw data in the sub-directories will be imported in one step. You may also choose to interpolate the RINEX file using a user defined interval. This is very important if your rover file and the reference file were not collected using the same logging interval.



4.7 Using the SKI-Pro Wizard to Post Process Raw GPS Data (continued)

Configuration of Data-Processing options

The behavior of the SKI-Pro post-processing can be controlled using the “Data Processing” parameters in GIS DataPRO’s General Settings menu (Tools>General Settings)



For each processing run, a set of results will be created. A set of results is comprised of: a list of Baselines, a list of Points (rover only), a list of data-processing Parameters, and a Logfile. After inspection of the data processing results you may select individual or all baselines and store them in the Project database and shapefiles. You may also choose to **Automatically Store all without Result page** option.

In the **Settings** dialog, you will see several Storage Options:

- 1) No automatic behavior: If this option is selected, the data-processing will switch to the Results-View Window after processing and the results will have to be stored manually.
- 2) Switch to Result page and select using criteria: After processing, the Results View will be activated showing the Point Results. The points will be selected based upon the settings of the selection criteria.
- 3) Auto store based upon criteria: After processing the points will automatically be stored based upon the settings of the selection criteria.
- 4) Auto store all without Result page: This is the default option. If this option is selected the data-processing will NOT switch to the Results-View after processing, all points will be stored automatically.


4.7 Using the SKI-Pro Wizard to Post Process Raw GPS Data (continued)

The next two choices for 'Overwriting rules,' will result in the following:

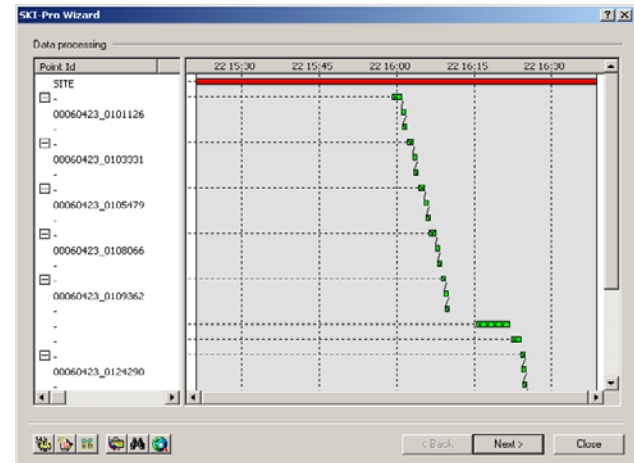
- 1) Overwrite all data: update all data
- 2) Overwrite non-corrected data only:
update only the non-differentially corrected data in rover file


The last two choices in the **Settings** dialog box will set Limits for Automatic Coordinate Averaging, and will set the maximum distance between different solutions for position, and for height. The limit (max. distance between different solutions) in Position and Height for the automatic coordinate averaging (Mean) can be defined. (Please check on-line help for more information.) A solution has to comply with both limits (Position and Height) to be automatically averaged.

Post-Processing the data

Click on the Post Process icon  (globe) on the toolbar, or choose Post Process from the Tools menu to open the SKI-Pro Wizard and begin Post Processing. A red line in the dialog box represents the reference data. The shorter, green lines represent the rover data. The

green lines are shorter than the red line to indicate that the reference file has full coverage on the day the data was taken.



 If any rover interval is not within the interval of the reference data, it will not be differentially corrected.

For example, if the reference file is collected from 7am to 5pm, and your file contains data collected after 5pm, then

4.7 Using the SKI-Pro Wizard to Post Process Raw GPS Data (continued)

your data is not fully covered by the reference file and will not be corrected.

The SKI-Pro Wizard gives the option to deselect intervals so that they are not differentially corrected. To deselect data:

Right click within the gray area of the SKI-Pro Wizard dialog to display the processing options. A “floating” toolbar will appear with the following options:

Select All As, Deselect All, Select Mode, Zoom In, Zoom Out, Zoom 100%, Zoom to Day, Process, Processing Parameters, Graphical Settings, Windowing. For a complete explanation of all the features of the SKI-Pro Wizard, please refer to the GIS DataPRO on-line help system.

- Click **Select Mode** to bring up another menu. Select Mode allows you to change how the rover files, reference files, and intervals are defined in the SKI-Pro Wizard.
- Select the Rover option.
- Using the mouse, draw a box around the appropriate portion of the rover file that you want to deselect. The

deselected interval will change colors from green to gray.

In the left side of the window, there are two headers: Point ID, and Point class. The first row (SITE) is the reference file. Right clicking with the mouse on the first row brings up additional menu options: Expand, Expand All, Collapse All, Edit Point, Re-assign, Modify, Delete, Save As, Print, Find, Export To RINEX, Properties.


For a complete explanation of all these features, please refer to the GIS DataPRO on-line help system. In this menu, the Edit Point option allows the user to edit the reference file, in order to make sure that it matches the base file’s surveyed coordinates.

An **Automatic Search** option is available for obtaining reference data from the internet. By clicking on the **Internet GPS Search** button at the bottom of the SKI-Pro Wizard. A right click will toggle between manual or automatic site selection. (See page 41 for more information).

4.7 Using the SKI-Pro Wizard to Post Process Raw GPS Data (continued)

The rover file must be loaded prior to using the Automatic Internet Search. The search will automatically locate the ten closest reference files to the rover file.

To process data:

- Select Process from the Context-Menu, or press the Process button  on the bottom of the dialog box.

If you have chosen **Auto store all without Result Page** in General Settings, Data Processing tab, the shapefiles will be updated automatically when the SKI-Pro wizard is closed. (This is the default option.) In this mode you will not have a Results window.

If you are in the **Auto store all without Result Page** mode then you need not do nothing else and can skip the remainder of this section.

Without the Auto Store option

In storage modes that do not auto store, you will have to manually store the corrected data.

- Following processing press the **Next** at the bottom of the screen. The first time next will take you to a points screen, Click **Next** again and display the results screen.

This screen contains information for all the points that have been processed.

- In the Results view, expand the results folder to reveal the points folder
- Highlight the points folder on the left hand side of this screen

You will see the points list on the right. This list contains all points and nodes in the database. You will see that under the Stored Status column, the status is **No**.

- Right click on the points folder to open the context menu. Click **Select** and choose **All**. All points on the right will become highlighted.
- Again, right click on the points folder to open the context menu. Now click **Store** to save the processed data.

This will change all of the selected points to 'Yes.' The shapefile will be updated upon closing the SKI-Pro wizard.

4.7 Using the SKI-Pro Wizard to Post Process Raw GPS Data (continued)

Phase Post-Processing

GIS DataPro, and Leica GPS sensors are capable of collecting and processing phase GPS data and achieving centimeter-level accuracy. For phase processing you must have purchased the phase processing option and installed your phase dongle (see section "2.1 Installing GIS DataPRO" for more information on installing GIS DataPRO and the phase dongle). There are no special settings in GIS DataPRO to enable phase processing. If you have collected phase data in your rover and reference data, and your dongle is installed correctly, then SKI-Pro will phase process automatically.

If you need to check that phase processing is successful for some or all of your points turn off auto store options in General Settings > Data Processing, and post process again. If you examine the Ambiguity resolution column in the points screen, points that have been successfully phase processed will read a 'Yes' for that field.



If you have turned off the Autostore option remember to **Select** / **All** the points and **Store** your data.


4.8 Editing Data


The Map View Window is used to display and edit data inside of GIS DataPRO. The Map View Window allows you to view and select data, view properties of data, create new objects, and edit existing objects. GIS DataPRO offers six tools to control the extent of the Map View Window. They can be accessed through the Map menu, or through the toolbar. GIS DataPRO allows you to control the map view by using the following tools: Zoom In, Zoom Out, Zoom All, Zoom in by Factor, Pan, or Refresh. For a detailed description of each of these map display tools, please consult the GIS DataPRO on-line help.


Selecting Data

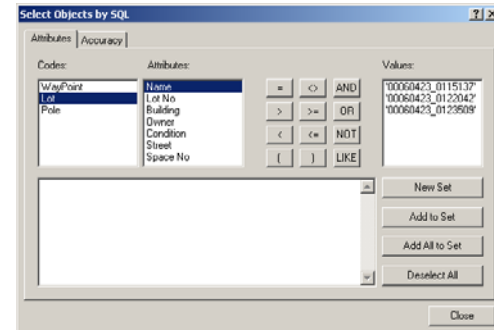
There are four ways to select data.

➤ To select an individual feature using the mouse:

➤ Press the Select Objects by Mouse icon  or choose Map, Select Object, by Mouse from the menu.

The cursor arrow will become an id cursor . At this point, you can proceed to select any item from the Map View Window.

- You can also use the id cursor to select multiple objects. To do this, hold down the left mouse button and drag the mouse in any direction. A window will be created. Any feature that is contained within, or is partially within the window, will be selected. Alternatively, you can hold down the 'Ctrl' key while selecting multiple objects.
- You can also select multiple features using Structured Query Language (SQL).
- From the Map menu, choose Select Objects, by SQL or click on the SQL button  to access the dialog.




4.8 Editing Data (continued)

- Select the code you wish to query, or query from all codes, then choose your Attribute, Qualifier, Operator, and Value.
(For more complete coverage of SQL, please refer to GIS DataPRO online help.)
- Press New Set if this is the first time the query is run, press Add to Set if you are adding to an original query, Add All to Set, or Deselect All to select none.

All features that satisfy your search criteria, will be selected.

You can also select specific nodes from line or area features.

- From the Map menu, choose Select Object, Multiple Nodes. Alternatively, you can press both the Select Objects by Mouse  , and Multiple Node Selection

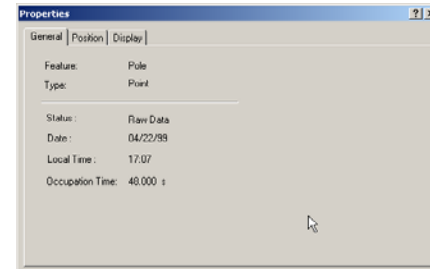


icons.

Feature Properties

Double clicking on any feature will bring up the feature property box.

The General and Position tabs display spatial information. These tabs display type of data (raw, real-time, post-processed, or created in the office), date, local time, occupation time, position, as well as position quality.

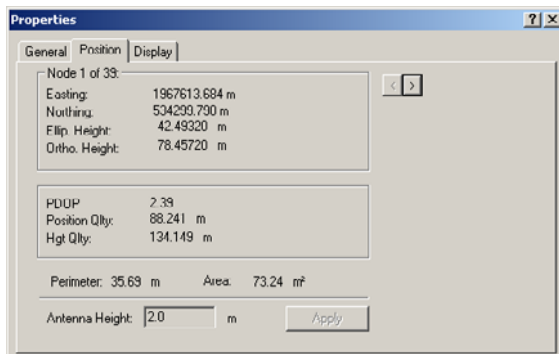


To change the date and time format displayed, make changes in the Windows OS Regional Settings.

The Display tab will allow you to change display characteristics of features such as font, symbol, color, and size.

4.8 Editing Data (continued)

Selecting a line will display its length; selecting an area will display its area and perimeter directly in the Map View Window. These are only estimates. The property sheets should be consulted for precise information.




The screenshot shows the 'Properties' dialog box with the 'Display' tab selected. It displays data for 'Node 1 of 33'. The data is organized into two sections: a top section with 'Easting: 1967613.684 m', 'Northing: 534293.790 m', 'Ellip. Height: 42.49320 m', and 'Ortho. Height: 78.45720 m'; and a bottom section with 'PDUP: 2.39', 'Position Qlty: 88.241 m', and 'Hgt Qlty: 134.149 m'. Below these sections, it shows 'Perimeter: 35.69 m' and 'Area: 73.24 m²'. At the bottom, there is an 'Antenna Height' field set to '2.0 m' and an 'Apply' button.

Property	Value
Node	Node 1 of 33
Easting	1967613.684 m
Northing	534293.790 m
Ellip. Height	42.49320 m
Ortho. Height	78.45720 m
PDUP	2.39
Position Qlty	88.241 m
Hgt Qlty	134.149 m
Perimeter	35.69 m
Area	73.24 m²
Antenna Height	2.0 m


Creating Objects

Objects can be created directly in the Map View Window, or by entering coordinates. To create an object, first activate the desired code in the Project Manager. For example, to create a new Island object, activate the Island code by clicking on it.


Creating Objects By Freehand

To create an object using the drawing tool, click the Create Objects By Freehand (Draw) icon  from the toolbar, or select Create Object, By Freehand from the Map menu. Use the cross-hair to position the new object and click the left mouse button to place the new object.

Bearing and Distance

This component allows you to check the bearing and distance between two features. Click on the Display Bearing and Distance icon  in the toolbar to activate this feature.

Creating Objects By Coordinates

To create an object using coordinates, click on the Create Objects by Coordinate icon  from the toolbar. Alternatively, you can select Create Object, By Coordinates from the Map menu.

4.8 Editing Data (continued)

Moving Nodes to a New location

You can also move line or area nodes. You cannot move multiple nodes at one time. They must be moved separately.

Switch Point Object Code

To change Point codes from one code to another:


- Right click on any point code within the Map View Window and choose **Switch Code** from the context-menu.
- The **Switch To** dialog will popup listing all available point codes in the project. Highlight the desired code and choose OK.

COGO Functions

You can also create and/or move objects using GIS DataPRO's COGO functions.

The following functions are available: Distance, Intersection, Bearing and Distance, Offset, Line Intersection. Please consult GIS DataPRO's on-line help for more information.

Deleting Objects

After selecting an object, or multiple objects, you can delete it by pressing the **Delete Object** icon  .

Or, from the map menu select Delete, Object.

After selecting a node, or multiple nodes, you can delete it by pressing the **Delete Node** icon

You can also select Delete, Node from the Map Menu.

4.9 Working with Offset Data

Sometimes, locations are hard to reach, the user is not able to stand directly on the desired position. Under these circumstances, the user can record the position by using an offset. An offset is a feature, of the GPS unit, that allows users to record positions from a distance. Because a GPS receiver is designed to compute the location of its antenna, the ability to apply offsets to features is an enhancement of GPS-based data collection systems. Leica receivers can record both a GPS position and an associated distance and direction to the object of interest.

Two methods to enter offset information:

- 1) User estimates a distance by using measuring tape and a compass to find the distance and bearing, respectively.
- 2) Obtain the offset by using a laser rangefinder device, such as Leica Laser Locator, with the GPS receiver. The distance measurement refers to the distance the user is from the object, while the bearing is the degrees from north. Declination represents the deviation between magnetic north and true north (also called

'grid' north). Declination can vary by time and location, and can affect offsets.

Points, lines, and polygon features can be offset. Only one offset can be applied to a point feature. For line and polygon (area) features, a single offset may not be appropriate. For example, 10 meters to the left, orthogonal to the direction of travel.


Leica GPS Sensors support line and area offset as well as the following point offset methods:

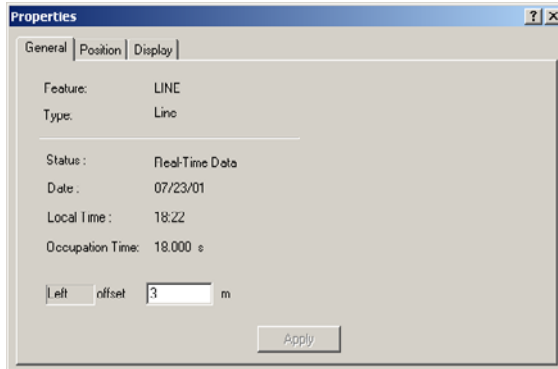
- Bearing and Distance
- Double Bearing
- Double Distance
- Backward Bearing and Distance, and
- Chainage and Offset (System 500 only)

(Please refer to Leica's GPS Sensor Manuals for more information).


4.9 Working with Offset Data (continued)

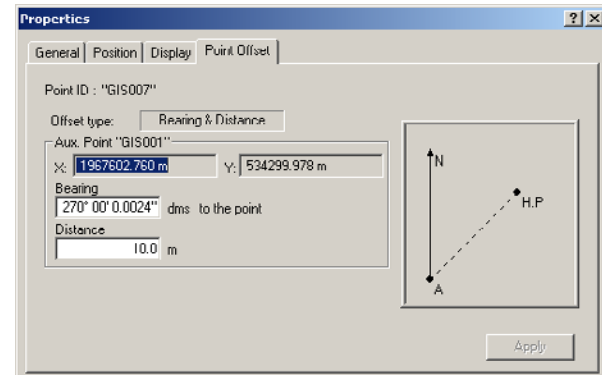
Line and Area Offset

- Click on the offset line or area feature using the Select Objects by Mouse tool  in the Map View Window.
- Right click on **Properties**. The offset information displays on the General tab.
- The distance can be edited and the results will be reflected in the Map View Window.



Point Offset

- Click on the offset point/node feature using the Select Objects by Mouse tool  in the Map View Window.
- Select a node and right click on **Properties**. In the resulting Properties menu, there are three tabs: General, Position, Display. If the data has been offset when it was recorded in the field, there will be a fourth tab, a Point Offset tab.

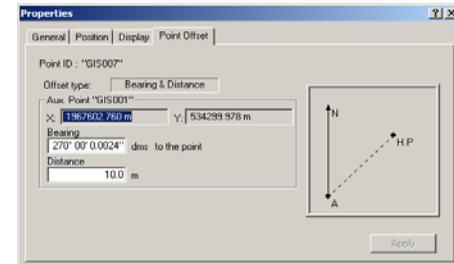


The Point ID (default attribute) will appear in this menu, as well as the offset type. Under Offset Type, GIS DataPRO

4.9 Working with Offset Data (continued)

reads whatever point offset method was used. The next two fields, X, and Y, indicate the point that was measured from, in the field, to calculate the offset point. The graphic to the right shows the offset point from north. HP stands for hidden point (the offset point), and A for auxiliary, which is the GPS point that the offset was measured from.

The point offset bearing and distance can be edited. Simply type in new numbers and click Apply. The bearing and distance will change and the offset will be adjusted. To change the display units for any offsets, click on Tools, General Settings, Units. For more information on offset features, refer to GIS DataPRO online help.



4.10 Using the Feature Browser

GIS DataPRO's feature browser allows you to display and edit attribute information for GPS features collected in the field. The Feature Browser allows you to browse for a specific feature without graphically selecting it. For example, if you have a long list of items in your database, such as fire hydrants, and you are only interested in silver fire hydrants, the Feature Browser allows you to browse specific attribute values.


At the bottom of the GIS DataPRO window, there are three tabs: Project, Browser, and Waypoint. Click on the Browser tab.

The Feature Browser should now be displayed on the left hand side of your screen.

To view an object's attributes, simply select the feature (see below), or group of features, and then select the arrow keys to move through the list.



Five methods to select objects:

- 1) Select object by mouse, clicking on one object.
- 2) Select a group of objects by dragging a box (with the mouse) across multiple objects.
- 3) Double click on the GPS interval in the Summary View to select objects collected during a common interval.
- 4) Enter the record (feature) number directly in the Feature Browser.
- 5) Click the Entire Database button  in the Feature Browser to load the entire feature database into the feature browser.

You can edit records by clicking on the field in the feature browser and entering the data directly, or by choosing items from the choice list. You can access the choice list using the up and down arrows which appear in each field when you click on it. GIS DataPRO will check the integrity of all data entered to ensure that the user/system defined ranges are not exceeded.

4.10 Using the Feature Browser (continued)



The attribute Name cannot be edited.

If multiple features are selected or loaded into the feature browser, each record can be accessed using the arrow keys:

Move to the first record in the current feature set



Move to the next record



Move to the previous record



Move to the last record



In addition to a feature or record being displayed in the feature browser, it will also be highlighted in the Map and the GPS Summary View.


4.11 Using the Waypoint Manager

Waypoints are recorded locations that a user wants to navigate back to in the field. The Waypoint Manager allows a user to take these locations back into the field for verification and/or update. Existing features can be converted into waypoints, or new waypoints can be created. These locations are then stored into the waypoint project, which can be imported into a GIS DataPRO project, and then uploaded to the sensor.

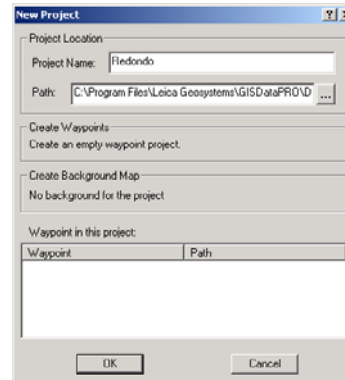
Unlike the System 500 GPS sensors, which require a special feature code for waypoints, the GS20 uses a database flag in the feature that can be toggled to define it as a waypoint or as a background map feature.

Creating a waypoint project for System 500


To create a waypoint project for the GS50, click on the Waypoint tab at the bottom of the GIS DataPRO window. You must create a waypoint project before creating any waypoints. To do this, click on the

New icon  on the top left side of the screen. Enter the location where the new waypoint project should be stored, and enter the name of the new waypoint project (maximum

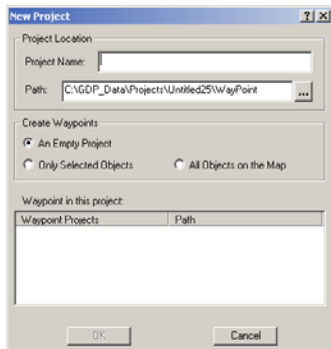
8 characters). The waypoint project names should appear in the gray area below the icons. You are now ready to add waypoints to your waypoint project.



Creating a waypoint project for GS20

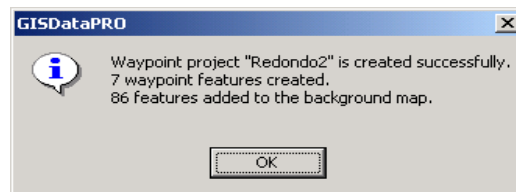
To create a waypoint project for the GS20, click on the New icon  on the top left side of the Waypoint Manager screen. Enter the location where the new waypoint project should be stored, and enter the name of the new waypoint project (maximum 8 characters).

4.11 Using the Waypoint Manager (continued)



If you select the radio button for the **All Objects on the map** option, GIS DataPRO creates waypoints out of all features in the current project.

If you select the radio button for the **Only Selected Objects** option, GIS DataPRO creates waypoints out of only the selected features on the map. Upon the completion of the waypoint project, GIS DataPRO displays a confirmation message.



Assigning A Waypoint's Status In The GS20:

GS20 uses a database flag in the waypoint feature that can be toggled to define a given waypoint as either Flagged or Visited. (Refer to the GS20 PDM Field Guide for more information).

To set Wapoint Status, click on the Position field for a given waypoint and select the desired waypoint status.

4.11 Using the Waypoint Manager (continued)

The screenshot shows two windows from a GIS application. The top window is the 'Waypoint Manager' with a title bar containing icons and a dropdown menu set to 'ISLAND'. Below the title bar, it says 'Waypoint Project: Redondo2'. It contains a table with three columns: 'ID', 'Position', and 'Feature'. The bottom window is the 'Node Coordinates' dialog box, which has input fields for 'Easting', 'Northing', and 'Height', each followed by a unit 'fts'. Below these fields is a 'Waypoint status:' dropdown menu with 'Flag as waypoint' selected. At the bottom of this dialog is an 'Apply' button.

ID	Position	Feature
Greg1113_0927592	X, Y, Z	ISLAND
Greg1113_0941559	X, Y, Z	ISLAND
PIER0021	X Y Z	TRASH

Node Coordinates

Easting : 6443373.066 fts

Northing : 1763939.364 fts

Height : -92.319 fts

Waypoint status: Flag as waypoint

Apply

Creating Waypoints

There are four methods to create waypoints:


1) Freehand

2) Enter Coordinates

3) Convert existing point features

4) Import from a shapefile

Click on the Project tab at the bottom of the screen. In the expanded codelist (left hand side of the screen), click on the “Waypoint” code. Once the “Waypoint” code has been highlighted, waypoints can be created by selecting the

Create Object by Freehand button  , or by entering waypoints using coordinates.

Creating a Waypoint Using Coordinates

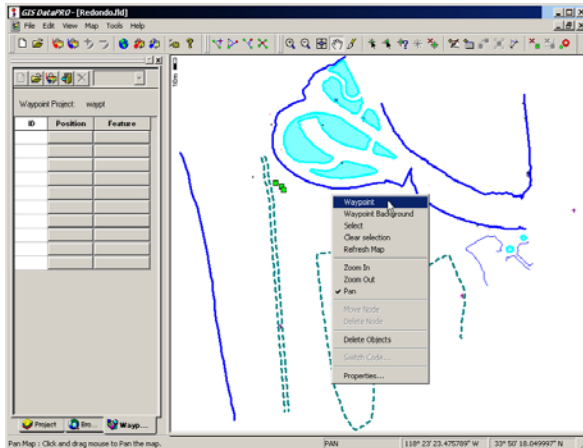
To create a Waypoint using coordinates, click any open cell in the Position column in the Waypoint Manager, or select Map, Create Object, By Coordinates from the menu. Enter the latitude, longitude, and height in the appropriate input boxes and press Apply. After creating a waypoint, the record will appear in the waypoint manager.

Converting existings features into waypoints

To convert an existing feature into a waypoint, right click on any point feature within the Map View Window, a menu will

4.11 Using the Waypoint Manager (continued)

appear. Select Waypoint from the menu to convert the feature you have selected to a waypoint. This will add the selected feature to the Waypoint project. The feature will remain in the project. You can also convert multiple point features to waypoints at the same time.




To convert multiple objects into waypoints: Click on the Select Objects by Mouse button and, using the mouse, draw a box around all of the points that you want to turn into waypoints. Once these objects are

selected, right click and select Waypoint from the menu that comes up.

Notice that the feature column in the Waypoint Manager for this newly created waypoint reads 'Waypoint.' You can attach any code to this waypoint.

Importing Waypoints from Shapefiles

To import waypoints from a shapefile:

- Click on the Import button  from the Waypoint Manager (Waypoint Tab at the bottom of GIS DataPRO).
- Highlight the shapefile you want to import.

To define your own naming convention, click on the Use automatic name generation radio button.

To name waypoints based on an attribute value, click on the **Use attribute value** radio button and select the attribute you would like to use.

4.11 Using the Waypoint Manager (continued)

- ☞ To use an existing shapefile attribute as a waypoint name, the attribute value must be unique and it must be in text format.

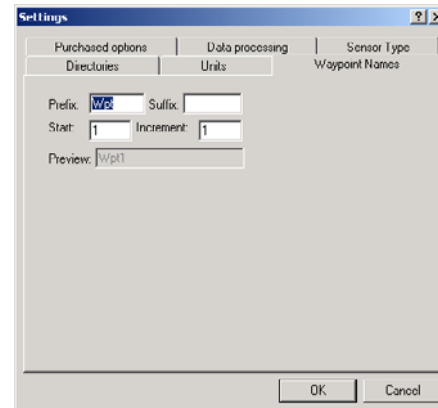
Naming Waypoints

You have the option of controlling the names of your waypoints. If this will aid your work it can be done as follows:

- From the Tools menu, choose the General Settings icon



- Click on the Waypoint Names tab in the Settings dialog.



To attach (or change) a code to a waypoint:
Highlight the waypoint code on the left hand side of the screen. Now, click on the Waypoint Tab at the bottom of the GIS DataPRO. Choose (highlight) a code from the list of attributes on the left hand side.

- ☞ In order to do this, a Waypoint Project must be open or have been created first.

4.11 Using the Waypoint Manager (continued)

Identical attribute values will be appended with a `._#`, where # will increment from 1 based on how many identical attribute values have been encountered.

Created waypoints will be displayed in the Waypoint Manager using the default waypoint Id (wpt#, where # increments from 1). You can also use the Waypoint Names template to define your own naming convention (maximum 17 characters).

The name consists of a number, supplemented by an optional prefix and suffix. The number increments by the defined step for each new waypoint that is created.

Deleting Waypoints

To delete a waypoint:

- Highlight the waypoint and press the delete icon



within the Waypoint Manager.

Transferring your waypoint project to the sensor:

To transfer your waypoint project to the sensor, you must first close the waypoint project.

- Press the Close icon  in the Waypoint Manager (tab at the bottom of the GIS DataPRO screen).

If you need to modify this waypoint project, simply open the project using the Open icon within the Waypoint Manager, and make the necessary changes.

Transfer all the waypoint project files to the \Geodb directory on the PCMCIA card. (See section "4.4 Transferring Data to/from the GPS Sensor") The prefix of the waypoint project files will be the waypoint project name you entered.



Waypoint projects created for GS20 are listed under Projects folder in Sensor Transfer module, whereas waypoint projects created for System500 are listed under Waypoints folder.

The waypoints can then be verified in the field using the Navigation function of the GPS sensor (Please see the user manual for your Leica GPS sensor).

4.11 Using the Waypoint Manager (continued)

Editing the attributes of waypoints

To edit attributes of waypoints, click on the Features cell within the Waypoint Manager to bring up an attribute table.

You can click on any cell within this table to change attributes.

GIS DataPRO performs integrity checking on all entered data as it does in the Feature Browser.

GIS DataPRO - [Untitled20.fld]

File Edit View Map Tools Help

BUILDING

Waypoint Project: Pier_wpt

ID	Position	Feature
PIER0061	X, Y, Z	BUILDING

Name	Value
COMMENT	OLD LIBRARY
OWNERSHIP	PUBLIC
MATERIAL	STUCCO
TYPE	MUNICIPAL
NO_OF_ST	2
ADDRESS	

Save Default Cancel

4.12 Exporting Data to your GIS/CAD

After importing, processing, and editing your data, the data is ready to be exported to a supported GIS format. GIS DataPRO uses the ESRI 2D Shapefile as its native format.

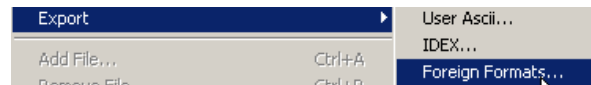
GPS data in GIS DataPRO is automatically converted into shapefiles, therefore, you do not need to export data when working with ESRI software or any software that accepts shpfiles. Shapefiles are stored in the /Leica Geosystems/GISDataPRO/Data/Projects/Your Project name directory. Please see the lesson at the end of this section for more information.


GIS DataPRO supports the following export data types:

- AutoCAD DXF, DWG
- Microstation DGN
- MapInfo MIF
- User Defined ASCII
- ESRI 3D Shapefiles

Exporting data to Foreign Formats

To export data to MapInfo MIF or AutoCAD format, Choose Export, Foreign Formats from the File menu.



Or, you can press the Export Foreign Formats  button from the toolbar.

The Export File dialog box will appear. Choose the type of file you want to create under the **Save As Type** drop down menu. Type a new filename into the dialog box and choose the location where you want to save the file.

The export module requires a table of information, which will tell it which attributes to export. This table is called a Lookup table. A current lookup table can be used, or one can be created now (see section "4.5 Importing Data from your GIS or CAD" for more information). GIS DataPRO requires a lookup table before you can proceed.

4.12 Exporting Data to your GIS/CAD (continued)

4.12 Exporting Data to your GIS/CAD (continued)

code, its corresponding attributes will be shown in the attributes window on the right.

You can deselect attributes by right clicking on the attribute, and choosing Deactivate from the popup menu. The deactivated attribute will not be exported. This procedure is similar for Microstation and MapInfo export. The units of the exported file are determined by the units set in the Units Tab in the General Settings dialog.

Exporting to Microstation

To export data to Microstation .DGN choose Export, Foreign Formats from the File menu.

The Export File dialog box will appear. From the **Save As Type** drop down menu, choose Microstation Files (*.DGN). Type a new filename into the dialog box and choose the location where you want to save the file.

The export module requires a table of information, which will tell it which attributes to export. This table is called a Lookup table. A current lookup table can be used, or one can be created now (see section "4.5 Importing Data from

your GIS or CAD"), however GIS DataPRO requires a lookup table before you can proceed. If there is no lookup table available, then the Save, Lookup, and Settings buttons will be grayed out.

After you have entered a filename and specified a lookup table, click on the **Settings** button. The General Tab displays coordinate type, datum, point type, and order of the coordinates to be exported. The Coordinate System tab allows the user to modify the coordinate system, ellipsoid, and geoid. However, the Microstation tab contains a directory (/Leica Geosystems/Shared/Templates/GISCAD) for template files that are used to sort exported codes. You can create your own customized template file, and point to it from this dialog. Click the OK button.

Once the filename and lookup table have been entered, you are ready to process the data. Press Save and GIS DataPRO will proceed to export the current feature database. A dialog showing the export process progress will appear.

4.12 Exporting Data to your GIS/CAD (continued)

Exporting to MapInfo.MIF

To export to MapInfo.MIF format choose Export, Foreign Formats from the File menu.

The Export File dialog box will appear. Choose MapInfo Files (*.MIF) from the **Save As Type** drop down menu. Type a new filename into the dialog box and choose the location where you want to save the file.

The export module requires a table of information, which will tell it which attributes to export. This table is called a Lookup table. A current lookup table can be used, or one can be created now (see section "4.5 Importing Data from your GIS or CAD" for more information).

Press Save and GIS DataPRO will proceed to export the current feature database. A dialog showing the export process progress will appear.


Exporting to ASCII

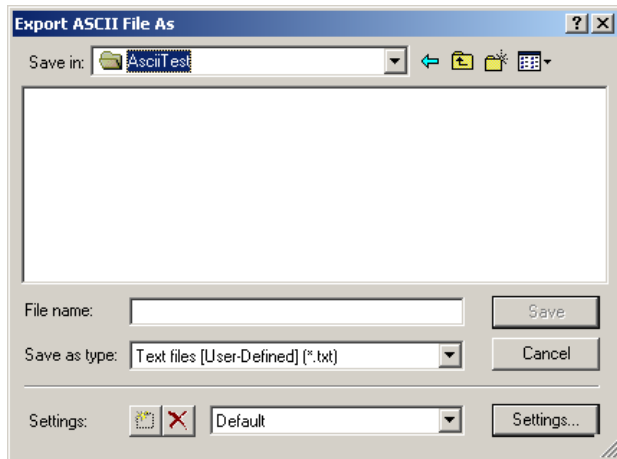
ASCII is a common acronym that stands for American Standard Code for Information Interchange. ASCII files are basically text files. The fields are separated by a comma, tab, or a user defined item. ASCII files are accepted by virtually all software packages, which makes them a convenient export format.

The **User Defined ASCII Export** component of GIS DataPRO allows points, lines and polygons to be extracted from Projects into a user definable ASCII file. The settings dialog will allow you to customize the content and format of the exported ASCII file. Each customized setting can be stored in its own template for repeated use.

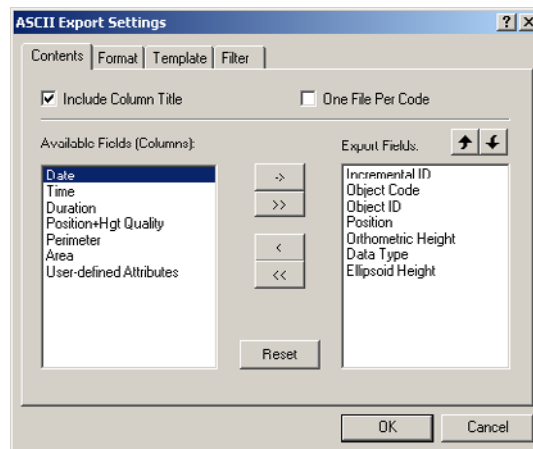
4.12 Exporting Data to your GIS/CAD (continued)

To export files to user defined ASCII format:

- Select File, Export, User ASCII, or click the Export ASCII button  from the toolbar. Both methods will return the Export ASCII File As dialog box.



- Click on the **Settings** button in the lower right hand corner of the dialog box.
- In the **ASCII Export Setting** dialog box, you have four tabs: Contents, Format, Template, and Filter.



The Contents Tab allows you to select which attributes are exported to the ASCII file as well as the order of the exported data.

The Format Tab allows you to select the output format as well as the unit precision for output coordinates.

4.12 Exporting Data to your GIS/CAD (continued)


The Template Tab allows you to define the ID counter, string separator, horizontal position order, and the header and footer for lines and areas. Headers and footers surround the collection of points output for each line or area. The Filter Tab allows you to filter certain data for export. You can choose to export raw data, corrected data, or both. You can also specify to export the selected data, the data displayed in the current Map View Window, or all data that has been loaded into the Project.

- Select the Template tab. Choose the options for the file to be saved (which rows, header, footer, and what to use as a field separator).

This template file will then save all ASCII export settings you define from the ASCII Settings dialog. All template files are stored in the /Leica Geosystems/GISDataPRO/Global directory.

GIS DataPRO comes with a default template. You may also create a your own template.

To create an ASCII template :

- Click the New Template button  from the **Export ASCII File As** dialog.


- Enter a File name for the new template.

This template file will then save all ASCII export settings you define from the ASCII Settings dialog.

All template files are stored in the /Leica Geosystems/GIS-DataPRO/Global directory.

To delete an ASCII template:

- Choose the template you wish to delete from the drop-down box.

- Click the Delete Template button  from the **Export ASCII File As** Dialog.

ASCII Export Settings

To change the content and format settings of the ASCII export, click the Settings button on the **Export ASCII file As** dialog.

4.12 Exporting Data to your GIS/CAD (continued)

Upon exiting the ASCII export Settings dialog box, the last used setting will be stored. This will be loaded the next time ASCII export is used. The units of the exported ASCII file are determined by the units set in the Coordinate System Tab in the Project Properties dialog.

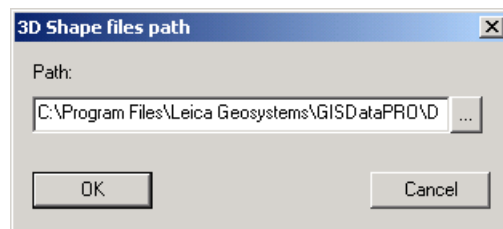
Exporting to 3D Shapefiles

GIS DataPRO by default generates ESRI 2D shapefiles. 3D shapefiles store x,y and z coordinates in the feature geometry. In GIS DataPRO 2.1, the 2D shapefiles can easily be converted to ESRI 3D shapefiles using the Export to 3D shapefiles option.

- Choose Export, 3D shapefiles from the File menu.



- Specify the output file path, click OK.



We recommend users to compute orthometric height first in GIS DataPRO before exporting to 3D shapefiles. When orthometric heights are present, the value will be saved as the Z coordinates for the output 3D shapes. Otherwise, the ellipsoidal heights will be stored.

More on ESRI Shapefiles

GIS DataPRO will automatically create a 2D shapefile for each code that is loaded into your project. These shapefiles will be created in the default project directory:

../GDP_data/Projects/Your Project name

4.12 Exporting Data to your GIS/CAD (continued)

This location can be changed from the Tools, General Settings dialog.

Use Windows Explorer to copy a shapefile (*.shp, *.shx, *.dbf) from the project directory to the desired location.

The projection and units stored in these shapefiles, will be defined by the Coordinate System and units attached to the project which generated them. The Coordinate system and units can be attached when you create a new project, or can be changed from the Project Properties dialog.

For more information on shapefiles, please consult the ESRI Shapefile Technical Description whitepaper (www.esri.com/library/whitepapers/pdfs/shapefile.pdf).

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